

REMARKS

Applicant requests favorable reconsideration and allowance of the subject application in view of the preceding amendments and the following remarks.

Claims 27-50 are presented for consideration. Claims 27, 36 and 47-50 are independent. Claims 27-50 have been amended to clarify features of the subject invention. Support for these changes can be found in the application, as originally filed. Therefore, no new matter has been added.

Applicant requests favorable reconsideration and withdrawal of the rejection set forth in the Office Action.

Claims 27-50 were rejected under 35 U.S.C. § 102 as being anticipated by U.S. Patent No. 5,243,195 to Nishi. Applicant submits that this patent does not teach many features of the present invention as previously recited in these claims. Therefore, this rejection is respectfully traversed. Nevertheless, Applicant submits that independent claims 27, 36 and 47-50, for example, as presented, amplify the distinctions between the present invention and the cited art.

In one aspect of the present invention, independent claim 27 recites an apparatus for determining a position of a mark on an object placed on a stage. The apparatus includes an image sensing system which has an image sensor and obtains image data of one accumulated image of the mark by accumulating image signals corresponding to an image of the mark formed on the image sensor during an accumulation period, a measurement system which measures a position of the stage plural times during the accumulation period of the image sensor, and an arithmetic section which calculates the position of the mark based on the image data obtained by

the image sensing system and data of plural positions of the stage measured by the measurement system during the accumulation period of the image sensor with respect to the image data.

In another aspect of the present invention, independent claim 36 recites an exposure apparatus including a stage on which a substrate is placed, a lens section which projects a pattern onto the substrate, a first measurement system which has an image sensor and measures a position of a mark formed on the substrate based on image data of one accumulated image of the mark that is obtained by accumulating image signals corresponding to an image of the mark formed on the image sensor during an accumulation period, a second measurement system which measures a position of the stage plural times during the accumulation period of the image sensor, a calculation section which calculates the position of the mark based on data of the position of the mark measured based on the image data by the first measurement system and data of plural positions of the stage measured by the second measurement system during the accumulation period of the image sensor with respect to the image data, and a positioning system which drives the stage based on data of the position of the mark calculated by the calculation section.

In a further aspect of the present invention, independent claim 47 recites a method for determining a position of a mark on an object placed on a stage. The method includes steps of first measuring of a position of a mark formed on the object based on image data of one accumulated image of the mark that is obtained by accumulating image signals corresponding to an image of the mark formed on an image sensor during an accumulation period, second measuring of a position of the stage plural times during the accumulation period of the image sensor, and calculating the position of the mark based on data of the position of the mark

measured based on the image data in the first measuring step and data of plural positions of the stage measured in the second measuring step during the accumulation period of the image sensor with respect to the image data.

In still another aspect of the present invention, independent claim 48 recites a method adapted for an exposure apparatus having a stage on which a substrate is placed, and a lens section which projects a pattern onto the substrate. The method includes steps of first measuring of a position of a mark formed on the substrate based on image data of one accumulated image of the mark that is obtained by accumulating image signals corresponding to an image of the mark formed on an image sensor during an accumulation period, second measuring of a position of the stage plural times during the accumulation period of the image sensor, calculating the position of the mark based on data of the position of the mark measured based on the image data in the first measuring step and data of plural positions of the stage measured in the second measuring step during the accumulation period of the image sensor with respect to the image data, and driving the stage based on the position of the mark calculated in the calculating step.

In a yet further aspect of the present invention, independent claim 49 recites a method of manufacturing a device, using an exposure apparatus having a stage on which a substrate is placed, and a lens section which projects a pattern onto the substrate. The method includes steps of placing the substrate applied with a resist on the stage, first measuring of a position of a mark formed on the substrate based on image data of one accumulated image of the mark that is obtained by accumulating image signals corresponding to an image of the mark formed on an image sensor during an accumulation period, second measuring of a position of the stage plural

times during the accumulation period of the image sensor, calculating the position of the mark based on data of the position of the mark measured based on the image data in the first measuring step and data of plural position of the stage measured in the second measuring step during the accumulation period of the image sensor with respect to the image data, aligning the substrate using the stage in the exposure apparatus based on data of the position of the mark calculated in the calculating step, and transferring a pattern to the substrate using the lens section.

In another aspect of the present invention, independent claim 50 recites an apparatus for determining a position of a mark on an object placed on a stage. The apparatus includes a first measurement system which has an image sensor and measures the position of the mark based on image data of one accumulated image of the mark that is obtained by accumulating image signals corresponding to an image of the mark formed on an image sensor during an accumulation period, a second measurement system which measures a position of the stage plural times during the accumulation period of the image sensor, and a calculation section which calculates the position of the mark based on data of the position of the mark measured based on the image data by the first measurement system and data of plural positions of the stage measured by the second measurement system during the accumulation period of the image sensor with respect to the image data.

By such an arrangement, in the present invention recited in independent claim 27, for example, the arithmetic section can calculate the position of a mark based on image data obtained by the image sensing system and data of plural positions of the stage measured by the

measurement system during the accumulation period of the image sensor with respect to the image data.

Applicant submits that the cited art does not teach or suggest such features of the present invention, as recited in the independent claims.

The Nishi patent discloses a photoelectric sensor 121, which is a photomultiplier. This is discussed in the Nishi patent at column 11, line 50, to column 12, line 7. The sensor 121 detects an amount of incident light to generate signals SSD, while a light emission mark IFS scans a reticle RM₁. The signals SSD are digital-sampled to present a waveform in accordance with the up and down pulse output from interferometers IFX and IFY.

Still further, the Nishi patent discloses CCD cameras as components of an off-axis alignment system and a TTR system. Applicant submits, however, that the Nishi patent is unrelated to measuring a position of a stage plural times during an accumulation period of an image sensor. In particular, Applicant submits that the Nishi patent fails to teach or suggest, for example, an arithmetic section which calculates the position of a mark based on image data obtained by an image sensing system and data of plural positions of a stage measured by a measurement system during an accumulation period of the image sensor with respect to the image data. Applicant submits, therefore, that the Nishi patent does not teach or suggest salient features of Applicant's present invention, as recited in independent claim 27. For similar reasons, Applicant submits that the Nishi patent does not teach or suggest similar features of the present invention recited in independent claims 36 and 47-50. For these reasons, Applicant

submits that the Nishi patent should not be read to anticipate Applicant's present invention, as recited in the independent claims.

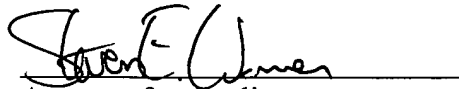
For the foregoing reasons, Applicant submits that the present invention, as recited in independent claims 27, 36 and 47-50, is patentably defined over the cited art.

Dependent claims 28-35 and 37-46 also should be deemed allowable, in their own right, for defining other patentable features of the present invention in addition to those recited in their respective independent claims. Further individual consideration of these dependent claims is requested.

Applicant further submits that the instant application is in condition for allowance. Favorable reconsideration, withdrawal of the rejection set forth in the above-noted Office Action and an early Notice of Allowance are requested.

Applicant's undersigned attorney may be reached in our Washington, D.C. office by telephone at (202) 530-1010. All correspondence should be directed to our address listed below.

Respectfully submitted,


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